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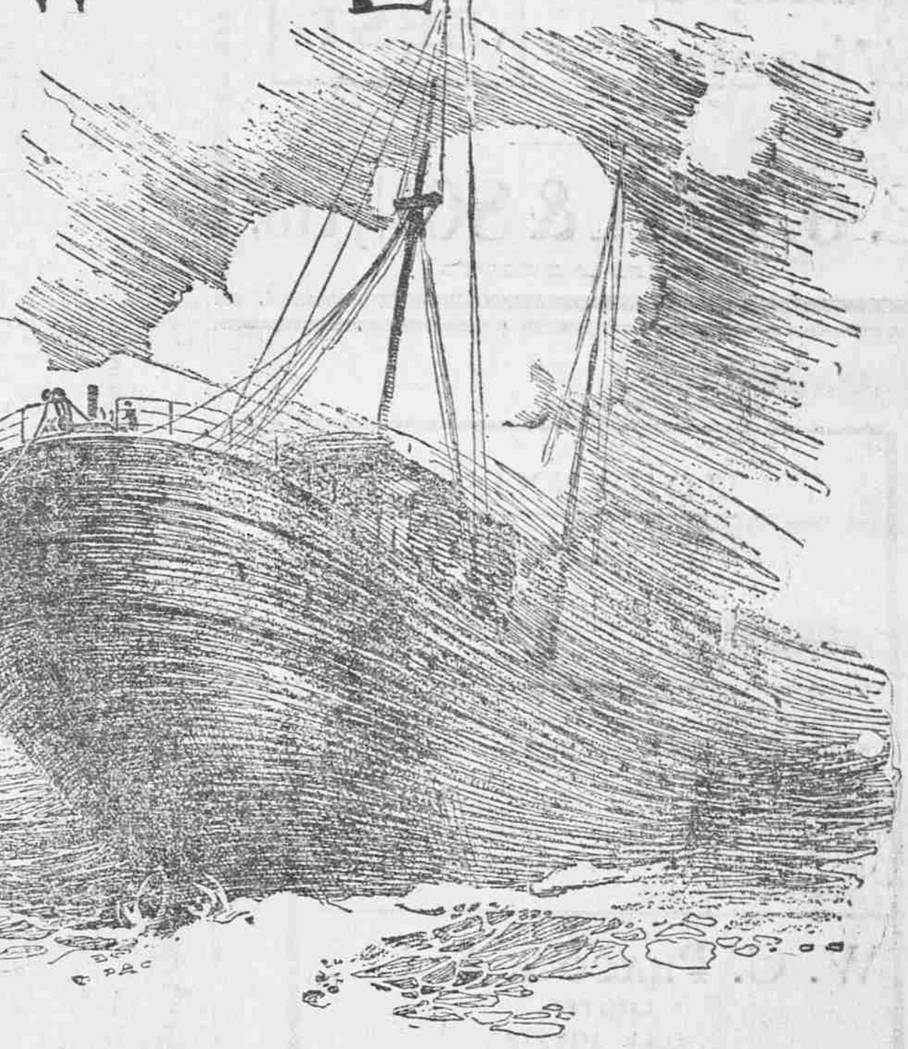
HOW THE NEW PACIFIC CABLE WILL BE LAID

Stupendous Feat of Engineering That Will Complete the Telegraphic Band Around the World and Connect California With the Orient.

JOHN W. MACKAY.

PHOTO BY TABER.



The Examiner.

WASHINGTON STAR DENOUNCES THE ANTI-DOLE MOVEMENT

JUDGE ABRAM S. HUMPHREYS of the Hawaiian bench has left for home after securing an exoneration from the administration in the face of charges which had been brought against him by the bar association of Honolulu. It is reported that he intends, upon his arrival at the Hawaiian capital, to institute a vigorous campaign for the removal of Governor Dole from his position and for the appointment in his stead of Harold M. Sewall, the last minister to Hawaii from the United States. The report may easily be believed, for both Judge Humphreys and Mr. Sewall represent an element in Hawaii bitterly opposed to Governor Dole and his supporters. They have caused a great deal of trouble. They are carpet-baggers who have not hesitated to associate themselves with and to make use of the lowest elements in Hawaii. They so confused the political situation there that it was possible for Robert Wilcox to come to Washington as territorial delegate, to bring discredit upon the new island adjunct. The record of the Sewall-Humphreys campaign is a disgrace to American politics.

Governor Dole is despised by these men and their followers because they cannot manage him to suit their wishes. He has given Hawaii an excellent administration from the outset, when he undertook the dangerous and difficult task of governing as president of the provisional republic, to the present time, through all the menaces and changes which have visited the islands. He has held his head high above scandals, has striven against tremendous odds for progress and finally in the days of the disgraceful native-led legislature he saved the territory from bankruptcy and confusion by bravely vetoing the nonsensical and dangerous measures passed by that absurd body.

President McKinley fully understood the reasons why it was essential to the welfare of Hawaii that the anti-Dole faction should not be encouraged. He appreciated Mr. Dole at his true worth and sustained him in his struggles against the adverse elements. President Roosevelt is not likely to be misled now by clamor against the governor who has steered Hawaii through the tortuous channels of revolution, intrigue and annexation. If he examines the record and consults with those who are familiar with the situation he will learn that the issue which Judge Humphreys seeks now to raise is one of personal preferment involving a serious choice of policies. He will find that Governor Dole represents the safe elements in Hawaii, which snatched the islands from monarchical corruption, and if supported will save them from native corruption and incompetence now. The American-born politicians who are now seeking to secure the upper hand would soon precipitate a personal issue of another sort. They would utilize the ignorant kanakas to further their own ends and to ruin their enemies.

Hawaii is too promising a territory to be relegated now to the limbo of political squabbles. It has within it the possibilities of a rich, prosperous, happy community, when the unrest caused by the revolution and the annexation has been quieted. The best way to reach that end is to utilize the elements which have thus far saved Hawaii from disgrace and disaster and to ignore those whose tendencies are destructive and retrogressive.

AT LAST the Pacific cable is to be laid—and by a Californian. The Commercial Pacific Cable Company, composed of John W. Mackay, Clarence H. Mackay, Edward C. Platt, Albert Beck, George G. Ward, Albert B. Chandler and William W. Cook, having been duly incorporated, announces that within nine months cable communication with Hawaii will be established, and in two years from now we shall be in electric touch with the Philippines.

The route will be from San Francisco to Honolulu, thence to the Midway islands, to Guam and to the east coast of Luzon. The cable will be 6,912 miles long, completing the telegraphic system of the entire globe, and making a total of 164,586 miles, all of which, excepting 16,171 miles, is controlled by private individuals.

At the coming session of Congress a bill will be introduced to push through the construction of the cable.

The estimate of cost by Rear Admiral Bradford of the Naval Bureau of Equipment is $10,000,000.

The special demands by the Government on this cable will be reduced rates and absolute control over the line in time of war.

The laying of a trans-oceanic cable is a stupendous task and one full of thrilling and picturesque incident.

The cable itself consists, first, of a core which comprises the conductor made of a strand of copper wires and the insulating covering generally made of gutta-percha, but occasionally of india-rubber to prevent the escape of electricity.

Then comes a layer of tanned jute yarn laid over the gutta-percha to protect it from the sheathing of steel wires over which come again jute yarn and a bituminous compound. The sheathing varies in type with the depth of the water in which it is laid. The deepsea type has a sheathing of many small steel wires; then through several intermediate types the sheathing wires become gradually large until finally at the shore end the deep sea sheathed cable is again sheathed with strands, each made up of three steel wires set triangularly. It will be noticed, however, that the core is the same throughout.

The copper wires for the conductor are twisted up together or stranded. They are then passed through the covering machine, by which the gutta-percha is squeezed round the conductor in a continuous envelope touching it throughout. The coil is then served with jute yarns, which are laid spirally round it, forming an elastic soft bedding for the sheathing wires. These latter, as well as the outer serving and compound, are put on in one machine. The served coil, passes through a hollow shaft of a circular skeleton frame work of iron, to large circular iron tanks, in which it is kept under water.

The rate of manufacture is unusually rapid, being for the deep-sea type more than five nautical miles (a nautical mile, 2,029 yards) per machine in twenty-four hours; and as the manufacture is carried on continuously day and night with ten-cable machines in operation all at once it will be seen that from fifty to fifty-five nautical miles can be turned out in every twenty-four hours.

The last cable that was made for Mr. Mackay several years ago, which stretched across the Atlantic 2,201 nautical miles in length, aggregated a total of 5,460 tons in weight, made up of the following compound parts: Copper wire, 495 tons; gutta-percha, 315 tons; jute yarn, 575 tons; steel wire, 3,000 tons and compound and tar, 1,075 tons. Over three times as much material will be required for the Pacific cable.

The cable ship itself is a vessel of strange interior arrangement, specially designed for the purpose. It is not only a huge storage department, but a big floating workshop as well.

In the hold there are three immense iron tanks, similar to the land tanks at the manufactory, thirty-four feet in diameter, for the storage of the cable, each having a conical core for guiding the cable when it is being paid out. The space within these cores is utilized to hold fresh water. The capacity of its tanks in the regular cable ship is about 1,400 tons of cable, this being the equivalent of about 100 miles of inshore cable, weighing fourteen tons to the mile or 700 miles of the deep-sea type, weighing about two tons per mile.

The cable tanks are all connected by "ways" or troughs, so that a transfer may be made from one tank to another or from any tank to either of the huge paying out machines. Handling of the cable made necessary by such transfer is usually done by means of a small engine connected to a drum, and all mounted on a truck by which it may be moved about the deck.

As the cable is brought from the tank it passes over an iron sheave, fastened to the framework of the hatchway, thence around another larger deeply grooved iron sheave, and the friction of the cable at this point acts as a tension. It then passes several times around the giant drums of the great dynamomcter, over several pileys on the deck and out over the sheave of the stern to its resting place at the bottom of the sea.

The dynamometer indicates the amount of strain to which the cable is subjected at any moment and also enables the man in charge of the brake-wheel to regulate the strain put on by the brake to suit the varying conditions of laying. After leaving the dynamometer it passes under and over several large retarding wheels before wending its sinuous way into the sea.

When all the available cable has been laid, the end is carefully sealed up and, having been attached to a rope, is lowered to the bed of the ocean. A buoy is attached to the other end of the rope and is left floating on the surface of the water to mark the position of the end of the cable, until the ship can return to port with a new cargo.

Sometimes a break or a "fault" will develop in the laying and steps have to be taken to locate the defect. Scientific accomplishment, which in reality is nothing short of wonderful, has made this a comparatively simple matter.

The conductor of the cable offers a certain amount of obstruction or "resistance" to the passage of the electric current. Apparatus has been devised for measuring the amount of this resistance. The unit of resistance is called an Ohm, after the great German physicist who discovered and expounded the laws of electric current. The exact resistance per nautical mile of the conductor of any given cable is known to the electrician in charge. Resistance practically ceases at the point where the conductor makes considerable contact with the water. Therefore, supposing the known resistance per mile to be two Ohms, and the measuring apparatus indicates a total resistance of 800 Ohms, the position of the break will be 400 miles from shore, or from the cable ship, as the case may be.

With this information the captain of the steamer is able to determine by his charts the course of the cable, the latitude and longitude in which the break has occurred, and can proceed with certainty to effect the repair.

Being satisfied that the ship is at the right place, a conical flat bottomed buoy is dropped from which to carry on operations. The ship leaves the buoy and steams away to a convenient distance from the supposed broken end of the cable. A heavy grappling hook is lowered and the ship steams back at right angles to the line of the cable, until the dynamometer gives notice that something has been seized. If the strain be erratic the grapnel is probably only engaging the projections of an uneven bottom, but if the strain steadily increases, the cable has been caught. This is an interesting process, especially in water over three miles deep.

The ship is then stopped and the hauling in machinery set in motion. In due course the grapnel holding the cable appears. Men are lowered to it who secure the cable by chains on each side of the bight, which is then cut in two. The ends are hauled on board and connected with the testing room. One of the ends will be surely that of the sections which is now a means of communication with the shore. The other end will be the short piece from the ship to the point of fracture.

The tests and communication with the shore indicating that the cable on that side is electrically perfect, the end is sealed, attached to a buoy and dropped overboard. The short piece to the fracture is picked up and stored away. The steamer then proceeds to grapple for the other end, which is then turned over to the splicing gang, who lay back the outer steel wire armor so that when the core of both ends has been cut and joined, the armor wires relaid, will overlap the joint some fifteen feet. The two ends of the conductor are scarfed and firmly soldered together. When the other layer of wires and jute yarn and gutta-percha are put in place the splice is complete and the cable is again dropped overboard, once more in perfect condition. The cable ship then steams away over its course, finds the cable and once more proceeds across the ocean.

On May 6th, 1899, the United States ship Nero began the survey to locate a route for a cable from the United States across the Pacific to the Philippines.

"A satisfactory route for an all-American cable for the purpose of connecting these points," says Rear Admiral Bradford in his report, "has been discovered, thoroughly explored, surveyed and mapped."

The report of the operation of the Nero gives a great amount of data on ocean currents, prevailing winds and tidal influences in the parts of the ocean through which the route lies. In prosecution of the above mentioned work the Nero steamed in all 25,283 knots. Her duties consisted in measuring depths, ascertaining temperatures and obtaining the characteristics of the bottom of the ocean at equidistant stations situated twenty knots apart. Beginning at Honolulu the zigzag route to the Philippines by the Midway islands and Guam to the island of Luzon was thoroughly covered. Along this route an obstacle was encountered in the nature of a submarine abyss, the deepest yet known in the world. The abyss was named the Nero Deep, and its depth makes it necessary to deflect the direct route from the Midway islands to Guam. In this low area the Nero, by means of an extraordinary long sounding wire, was enabled to take two of the deepest casts and also two deepest water temperatures ever recorded. The depths found were 5,160 fathoms and the other 5,269 fathoms. The temperature at these points registered 35.9 degrees F. and 36 degrees F. respectively.

Here is a description of the route beginning at Honolulu:

An ocean bed of almost level soft mud at a general depth of about 2,700 fathoms extends from Honolulu to the Midway islands on a route a little to the northward of the line of reefs running about west-northwest from the Hawaiian islands to a point beyond Ocean island. This plan affords an ideal route for a telegraphic submarine cable.

Beyond the Midway islands toward Guam is another great level plain at a depth of about 3,200 fathoms.

The remainder of the distance, however, while in general fairly level, is interspersed with reefs and mountain ranges that required much time to explore and avoid. Eventually, a short distance to the eastward of the great

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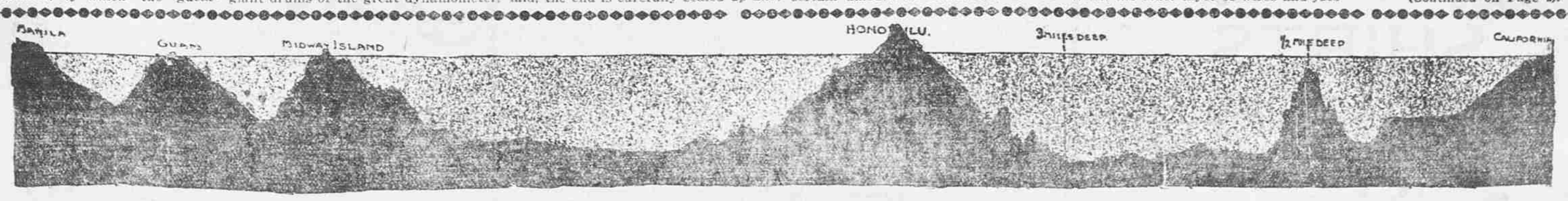

Silhouette Map of the Bottom of the Pacific Ocean, Showing the Route of the New Cable Between California and the Philippines and the Great Depth at Which the Huge Telegraph Wire Will Have to Be Laid.